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THESIS

**NAVY NURSE CORPS PROMOTION DURING WAR: THE
DEPLOYMENT EFFECT**

by

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March 2012

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**NURSE CORPS PROMOTION DURING WAR: THE EFFECT OF
DEPLOYMENT ON NAVY NURSE CORPS PROMOTION**

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ABSTRACT

This study examines factors affecting promotion of Navy Nurses from 2001 to 2010. The objective of the study is to identify important service and educational factors that affect promotion in a wartime environment. The study finds that deployment increases the probability of promotion to Lieutenant Commander, but does not have a significant effect on promotion to Commander or Captain. Other factors affecting promotion to Lieutenant Commander are critical wartime specialties and highest education in nursing. For Lieutenants, in addition to these factors, experience serving in a variety of locations positively affected promotion to Lieutenant Commander. As expected, advanced degrees positively affect the probability of promotion to Commander and Captain, while overseas assignments appear to have a negative impact on promotion to Commander. The study also finds that being a Nurse Practitioner or Certified Registered Nurse Anesthetist positively affects promotion across all ranks. Gender does not appear to be a significant determinant of promotion in any of the models.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACT	American College Test
AD	Active Duty
ANA	American Nurses Association
BSN	Bachelors of Science degree in Nursing
CAPT	Captain
CDR	Commander
CNP	Chief of Naval Personnel
CRNA	Certified Registered Nurse Anesthetist
CTS	Contingency Tracking System
DEERS	Defense Eligibility Enrollment Reporting System
DMDC	Defense Manpower Data Center
DOPMA	Defense Officer Personnel Management Act
FY	Fiscal Year
HADR	Humanitarian Assistance and Disaster Relief
JPME	Joint Professional Military Education
LCDR	Lieutenant Commander
LT	Lieutenant
MECP	Medical Enlisted Commissioning Program
NCP	Nurse Candidate Program
NNC	Navy Nurse Corps
NP	Nurse Practitioner
NROTC	Naval Reserve Officer Training Corps
OCS	Officer Candidate School

OEF	Operation Enduring Freedom
OGLA	Officer Grade Limitation Act
OIF	Operation Iraqi Freedom
OPA	Officer Personnel Act
PSUB	Primary Subspecialty Code
ROTC	Reserve Officer Training Corps
SAT	Scholastic Aptitude Test

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I. INTRODUCTION

A. BACKGROUND

The United States Navy Nurse Corps (NNC) has a competitive promotion system. Navy nursing is built upon a solid clinical foundation, and yields nurses “who are business savvy, operationally experienced and clinically adept” (Moore, 2009, para. 6). During each promotion cycle, the best and most qualified nurses are selected for promotion, regardless of nursing specialty. Retention of targeted specialties may be influenced by bonuses, but promotion is not. The goal of promotion is to select the future leaders of Navy Medicine.

This thesis examines promotion determinants of controlled grade officers in the United States Navy Nurse Corps (NNC) during wartime at three stages of their careers: promotion from Lieutenant (LT) to Lieutenant Commander (LCDR), from LCDR to Commander (CDR), and from CDR to Captain (CAPT). It is important to understand the effect that deployments have on promotion. Not only can this information help nursing mentors with career planning and advice, individual nurses can also use it when making career decisions.

The environment today is quite different from the environment in 1992 when the last NNC promotion study was conducted. One major change is the increased operational tempo due to the war. Over the past ten years, nurses deployed in support of both Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). Nurses have also been deployed in support of humanitarian assistance and disaster relief efforts. There is no research regarding how this environment has affected conventional promotion wisdom.

Other significant changes are unrelated to war. The demographics of the NNC are changing. Although men were not allowed into the NNC until 1964, men have always had more representation in the NNC than the civilian sector (Simpson, 1992). The participation of men in the NNC has increased over the years. By 2012, the NNC was 36.5% male (Personnel Planner, 2012).

In addition, healthcare is evolving in a way that may affect promotion determinants. Education has always been a significant determinant in NNC promotion, but its significance may not be the same in today's healthcare environment. As professional bodies mandate higher entry levels into practice, a phenomenon known as "degree creep" may affect the significance (Ashford, 2011). A Master's degree may no longer carry the edge it once did because it no longer sets the individual apart from the pack. Another change unrelated to war is in accession pipelines—avenues of entry into the NNC. As of the time of the last study on this topic, there were no Naval Reserve Officers Training Corps (NROTC) accessions and very few Medical Enlisted Commissioning Program (MECP) accessions eligible for controlled grade promotion.

B. RESEARCH QUESTION

The primary goal of this research is to analyze the effect of deployment on a member's probability of being promoted to the next rank at three stages of his or her career: from O3 to O4, O4 to O5, and O5 to O6.

The secondary aim of this research is to estimate the effect that other variables have on NNC promotion. Specifically, the thesis examines the effect of the following service and family characteristics on the probability of promotion for NNC officers: educational level and discipline, Nurse Practitioner or Certified Registered Nurse Anesthetist, critical wartime specialty (Operating Room, Critical Care, and Mental Health), accession pipeline, gender, race, assignment variation, assignment at one of the three large medical centers, overseas assignment, board certification, Joint Professional Military Education, marital status, and dependent quantity. The definitions of these variables are discussed in detail in Chapter III.

C. ORGANIZATION OF STUDY

This thesis is divided into seven chapters. The first chapter discusses the purpose of the study and details the research questions. Chapter II discusses relevant literature regarding retention and promotion. Retention and promotion are closely linked; trends in retention may be mirrored in promotion. Chapter III details the data sources, the general methodology, and variable definitions. This chapter includes the hypothesized

effect of the explanatory variables on promotion. The quantitative portion of the study begins in Chapter IV with the merging of the nurse database and the deployment database. This chapter provides a description of the data sample. Chapter V includes the regression models and presents the statistical results of the models. Chapter VI discusses the limitations of the study. The research concludes with Chapter VII, recommendations regarding promotion analysis and further study.

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II. LITERATURE REVIEW

A. CHAPTER OVERVIEW

Promotion is affected not only by an individual's ability, but also by factors beyond the individual's control. First, promotion is regulated by the Defense Officer Personnel Management Act (DOPMA) of 1980, which controls the number of promotions available at each controlled grade. Promotions are closely related to retention; in general, cohort retention and cohort promotion are inversely proportional. DOPMA is outside of an individual's control, but significantly affects promotion opportunity and force structure.

The Active Duty (AD) NNC is comprised of almost 3,000 authorized billets (Nurse Corps Personnel Planner, 2011). For Fiscal Year (FY) 2011, approximately 2,892 nurses were serving in the NNC (Nurse Corps Personnel Planner, 2011). Table 1 provides an approximate distribution by grade for FY 2011 (Nurse Corps Personnel Planner, 2011):

Table 1. Approximate Distribution of Active Duty Nurses by Grade

Rank	CAPT	CDR	LCDR	LT	LTJG	ENS	Total
Grade	O6	O5	O4	O3	O2	O1	
Number of Nurses	152	341	591	870	530	408	2892
Percentage of Nurses	5.26	11.79	20.44	30.08	18.33	14.11	100

Studies have examined the effect of retention and find a significant and persistent trend regarding accession sources. Some accession sources are linked with positive retention, while other sources are linked with negative retention. Because accession sources have changed significantly since the last promotion study, there is no evidence regarding promotion and current accession pipelines. Moreover, there are no studies

regarding deployment and NNC officer promotion. Section B of this chapter discusses the history of DOPMA and its effect on NNC promotions. Section C provides a ten-year overview of NNC promotion trends. Section D details current accession pipelines. Retention of NNC officers is discussed in Section E. Significant determinants to promotion in the NNC are discussed in Section F.

B. DEFENSE OFFICER PERSONNEL MANAGEMENT ACT AND NAVY NURSE CORPS PROMOTIONS

Promotion in the NNC was affected by the enactment of the Defense Officer Personnel Management Act (DOPMA) of 1980. DOPMA is the most recent Act regarding personnel management and the culmination of several decades' worth of attempts at managing personnel. In 1947, following World War II (WWII), Congress passed the Officer Personnel Act (OPA) (Rostker, Thie, Lacy, Kawata, & Purnell, 1993). This act was passed to ensure uniformity among the services, "youth and vigor" of the officer corps, and overall readiness of the peacetime military (Rostker, 1993, p. 3). Experiences in WWII changed promotion from a seniority-based system to a competitive up-or-out system (Rostker, 1993).

By 1954, Congress passed the Officer Grade Limitation Act (OGLA) (Rostker, 1993). This Act imposed statutory limitations on the number of officers who could serve in the grades of O-4 and above for both AD and reserve officers (Rostker, 1993). By 1972, Congress was still concerned that the services had too many senior officers and requested that the Secretary of Defense submit a report on controlling the number of officers at each grade (Rostker, 1993).

In 1981, DOPMA unified the post WWII reforms and 35 years of personnel experience into a single act (Rostker, 1993). DOPMA continued the up-or-out promotion system. In addition, DOPMA specifies the number of controlled grade officers allowed in the DOPMA grade table (Rostker, 1993). The distribution is not a fixed percentage, but varies as a function of total officer end-strength (Rostker, 1993). Specifically, for every 2,500 new officers, the Navy gets 750 field grades (Rostker, 1993).

Before DOPMA, nurses were promoted via the “running mate” system; each nurse was assigned an active duty line officer as a lineal running mate (Simpson, 1992). When the running mate came before a promotion board, so did the nurse (Simpson, 1992). After DOPMA, physicians and dentists were exempt from the new grade table, but nurses were not (Rostker, 1993). Promotion opportunity in the NNC suffered because nurses were left under DOPMA.

Promotion opportunity, by DOPMA, must be kept stable over the years. For example, promotion opportunity to Commander must be around 70%, plus or minus 10% (Personnel Planner, 2011). For promotion opportunity to remain stable, the number of officers eligible for promotion must be manipulated to ensure a stable selection rate. The selection rate is determined by dividing the number of selectees by the number of in-zone eligibles.

Because DOPMA requires promotion opportunity to remain relatively stable, flow points are another indicator of promotion opportunity. Flow points are the average years of commissioned service when an officer is promoted to a given grade. Although the NNC did receive grade compensation from the unrestricted line to support its grade structure, DOPMA affected the flow point (Simpson, 1992). In fiscal year 1990, the flow point to Commander in the NNC was 18 years and eight months compared to the unrestricted line officer flow point of 15 years and four months (Simpson, 1992). Flow points have remained within DOPMA guidance over the past ten years.

Promotion opportunity—the selection rate and the flow point—is closely related to retention. First, and most basic, an officer cannot be promoted if the officer is not retained. However, increased retention of some officers can adversely impact the promotion of other officers. If there are no vacancies in the higher grades due to retention of high-grade officers, then the flow points for the mid-grade officers could increase, signaling decreased promotion opportunity. Promotion opportunity could also increase because of a lack of retention in the lower grades, leaving fewer nurses eligible for promotion. A lack of retention in lower grades could trigger an increase in accessions; if those accessions are retained, promotion opportunity for this large cohort may decrease for controlled grade promotions as evidenced by longer flow points.

C. NAVY NURSE CORPS PROMOTION TRENDS

The following tables give an overview of promotion history over the past ten years. Please note that promotion opportunity was reduced in FY07 by the Chief of Naval Personnel (CNP) decision to reduce the number of controlled grade selects by 5%. The promotion plan indicated 36 CAPTs, 93 CDRs, and 188 LCDRs. Tables 2 through 4 display the opportunity and flow points over time. These data were obtained via the NNC Personnel Planner. Data prior to 2003 were not available and data past 2009 are provided for informational purposes only.

Table 2. Opportunity and Flow Points for LCDR Promotion

	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	DOPMA
Flow Point	N/A	N/A	10-03	10-04	10-01	10-08	10-06	10-00	9-10	10-00	9-00	9-01	10+/- 1year
Opportunity	N/A	N/A	80%	75%	80%	75%	76%	85%	90%	90%	90%	85%	80% +/- 10%
Selects	N/A	N/A	81	137	140	80	179*	147	95	91	156	131	

*indicates number reduced by CNP decision

Table 2 shows that promotion to LCDR remained fairly stable from 2001 to 2009. For the analysis period, opportunity was 75 to 90%, with flow points ranging between nine years and ten months to ten years and eight months. Fiscal Year 2011 is outside of the data range, but shows increased promotion opportunity, as evidenced by an opportunity of 90% and a flow point of nine years and zero months.

Table 3. Opportunity and Flow Points for CDR Promotion

	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	DOPMA
Flow Point	N/A	N/A	15-11	16-03	16-01	15-07	15-05	15-07	15-11	16-00	15-09	16-03	16+/1 1 year
Opportunity	N/A	N/A	70%	70%	70%	70%	76%	75%	70%	70%	75%	70%	70% +/- 10%
Selects	N/A	N/A	29	64	67	67	88*	56	29	N/A	N/A	N/A	

*indicates number reduced by CNP decision

Promotion to CDR has been more stable than promotion to LCDR. Across the data range (2000 to 2009) promotion opportunity varies between 70 to 76%. Flow points remain stable with a narrower range than the flow points for LCDR, 15 years and seven months to 16 years and three months. The increased promotion opportunity of the LCDRs over the most recent years is not mirrored in CDR promotions.

Table 4. Opportunity and Flow Points for CAPT Promotion

	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	DOPMA
Flow Point	N/A	N/A	21-11	21-07	21-02	22-07	21-06	21-07	21-11	N/A	N/A	N/A	22+/1 1 year
Opportunity	N/A	N/A	50%	50%	50%	50%	52%	50%	50%	N/A	N/A	N/A	50% +/- 10%
Selects	N/A	N/A	19	30	21	22	34*	19	19	N/A	N/A	N/A	

*indicated number reduced by CNP decision

Promotion to CAPT shows very little variation. Like CDRs, the increased promotion opportunity of LCDRs does not carry through to the CAPT level. CAPTs show the most stable promotion opportunity, as reflected by flow points and promotion opportunity. Opportunity ranges from 50 to 52%. Flow points range from 21 years and two months to 22 years and seven months.

Nurses are promoted above-zone, in-zone, or below-zone. Zones are established by officer seniority, maintained in the lineal list. An officer who is promoted above-zone

has previously been considered for promotion, but failed to select. An in-zone promotion occurs when an officer is promoted when his or her lineal number falls within the in-zone limits for that year's promotion board. A below-zone promotion is one where an officer is selected for promotion when his or her lineal number is below all of the officers in the in-zone, but the officer is still eligible for promotion. These promotions are rare. Only above-zone and in-zone officers incur a failure of selection if they are not selected.

D. BACKGROUND ON CURRENT NAVY NURSE CORPS ACCESSION SOURCES

Accession pipelines have changed drastically over the years. Most significantly, two programs have been added: Medical Enlisted Commissioning Program (MECP) and Naval Reserve Officer Training Corps (NROTC) Nurse Option. Both of these programs have significant effects on retention. It is important to discuss current accession sources, as they may have significant effects on promotion. Currently, the NNC gains nurses through: NROTC, MECP, Nurse Candidate Program (NCP), and direct accession.

1. Naval Reserve Officer Training Corps (NROTC)

The Nurse Option of the NROTC scholarship program, generally referred to as ROTC, was originally a two-year scholarship program (Wonderlich, 2001). It was initiated in response to the nursing shortage of the 1980s (Wonderlich, 2001). The two-year option had little success; the four-year scholarship program of today was started just two years later, in 1990, with 100 billets (Wonderlich, 2001). The first applicant was not commissioned until fiscal year 1992 so no analysis exists regarding promotion opportunity for NROTC graduates (Jonak & Paradis, 1998).

The program is open to candidates pursuing a Bachelors of Science degree in Nursing (BSN). Traditional entrants, those without prior service, must be younger than 27 at their anticipated commissioning date (NROTC, 2012). Applicants must have qualifying Scholastic Aptitude Test (SAT) scores of 530 in critical reading and 520 in math, or American College Test (ACT) scores of 22 in English and 21 in math (NROTC, 2012). Recipients of the scholarship receive tuition, books, lab fees, and a stipend (NROTC, 2012). They must participate in weekly NROTC drills, required naval classes,

and two summer training cycles (NROTC, 2012). Upon completion, the candidate is commissioned in the NNC and obligated to four years of active duty service (NROTC, 2012).

2. Medical Enlisted Commissioning Program (MECP)

The nursing shortage of the 1980s and the decreased retention rate of nurses spawned another accession source: MECP. The first NNC MECP gain was in 1987 (Personnel Planner, 2012 & Jonak & Paradis, 1998). There is evidence that MECs retain better than other accession sources, at least to LT or LCDR (Messmer & Pizanti, 2007). Because most MECs are retirement eligible at LT or LCDR, they may not retain to fill higher CDR and CAPT ranks (Messmer & Pizanti, 2007). The Simpson (1992) promotion study did not include this accession source, so there is no prior promotion analysis of nurses from this source.

This in-service procurement program (IPP) gives qualified enlisted personnel the opportunity to earn a BSN and a commission in the NNC. They must be no older than 42 at the time of the initial application (Navy Advancement, 2012). To qualify, applicants must have either 30 semester hours or 45 quarter hours that can be applied toward undergraduate requirements (Navy Advancement, 2012). They must have a minimum 2.5 GPA (on a 4.0 scale) and be able to complete the BSN in 36 months (Navy Advancement, 2012). Recipients receive full pay and benefits of their paygrade and may also use their Montgomery G.I. Bill (Navy Advancement, 2012).

3. Nurse Candidate Program (NCP)

The NCP is for students currently enrolled in a BSN program. Age restrictions vary and waivers are available (CNRC, 2012). Candidates receive an accession bonus of \$10,000, paid in two installments (CNRC, 2010). They also receive a \$1,000 monthly continuation bonus, up to 24 months (CNRC, 2010). An obligation of four years of active duty service is incurred for up to 12 months' participation (CNRC, 2010). A five-year obligation is incurred for participation of 13 to 24 months (CNRC, 2010).

After graduation, these nurses obtain their license and attend Officer Indoctrination School (CNRC, 2010). The first entrants via this accession source were seen in FY93 (Jonak & Paradis, 1998).

4. Direct Accession

Direct accession was initially the only accession pipeline, but now it is used only as a supplement to the other training pipelines (Jonak & Paradis, 1998). These accessions must have a bachelor's in nursing and be less than 35 years of age (Maeder, 1999). They are obligated to three years of commissioned service without a bonus, or four years of commissioned service with a bonus (Maeder, 1999).

E. RETENTION IN THE NAVY NURSE CORPS

1. Retention and Promotion Are Related

No discussion of promotion would be complete without a discussion of retention, as evidence suggests they are related. First, if a nurse is not retained, the nurse cannot promote. Also, promotion opportunity may influence retention decisions. Multiple regression analysis in civilian nursing literature has shown that promotion opportunity influences job satisfaction and that job satisfaction influences retention (Turner, 1990). The 1990 study by Penny Turner suggests that this is also true in the NNC.

Turner found that pay has a significant and positive influence on NNC retention; however, the American Nurses Association (ANA) survey of over 76,000 nurses found that pay was the least significant factor in job satisfaction (Turner, 1990 & Survey, 2005). In Turner's study promotion opportunity was not significant, but the ANA survey found that career development was one of the top three satisfiers for nurses (Turner, 1990 & Survey, 2005). These conflicting results may be due to the fact that pay and promotion cannot be disentangled in the military. The effect that promotion opportunity has on retention may have been reflected in the positive significance of pay, suggesting that promotion opportunity and retention are related.

Prior studies find that several variables significantly increase the probability of retention. In their NNC retention study, Messmer and Pizanti (2007) find that education

is the most significant variable for retention, with a postgraduate degree drastically increasing retention. They also find that specialized nurses, particularly medical-surgical and administrative, tend to retain (Messmer & Pizanti, 2007). All the NNC retention studies find that MECP accessions are the most likely to retain. It is important to note that due to their prior enlisted time, MECPs may be eligible for retirement before eligibility for controlled grade promotions. Studies also find that males retain at higher rates (Messmer & Pizanti, 2007). Having children increases the probability of retention for both married and single officers; the effect is slightly stronger for married officers (Messmer & Pizanti, 2007). Black officers and other non-white officers have a higher probability of retention than white officers (Messmer & Pizanti, 2007).

Other studies provide evidence that some variables do not affect retention. Kathryn Krause investigated the effect of placement at the Big Three (colloquial reference for the Navy's three large medical centers: Naval Medical Center Portsmouth, Naval Medical Center San Diego, and the former National Naval Medical Center in Bethesda); she found no evidence that initial placement at one of the Big Three had a positive effect on retention (Krause, 2010). Messmer and Pizanti (2007) find that, of the Big Three, only Portsmouth is significant for retention (Messmer & Pizanti, 2007). The retention effect of Portsmouth, however, is very strong (Messmer & Pizanti, 2007). Bethesda and San Diego were not significant variables for retention (Messmer & Pizanti, 2007).

F. SIGNIFICANT DETERMINANTS OF PROMOTION

The NNC does not have a body of literature regarding promotion. There has been only one study providing coefficients for NNC promotion variables: Peggy Simpson's 1992 study. She found the effect of the variables depended upon the promotion category (LCDR, CDR, and CAPT). For example, she found that being a minority or a male decreased the probability of promotion to LCDR (Simpson, 1992). These effects did not persist in the CDR and CAPT models (Simpson, 1992).

The most significant determinant was postgraduate education; it increased the probability of promotion to both CDR and CAPT (Simpson, 1992). In fact, it was the

ONLY significant variable for promotion to CAPT (Simpson, 1992). She did not analyze the effect of a postgraduate degree on promotion to LCDR; she analyzed a minimum of a bachelor's degree (Simpson, 1992). At the CDR and CAPT level, Simpson found that having a postgraduate degree outside of nursing increases the officer's probability of promotion, but not as much as a postgraduate degree in nursing (Simpson, 1992).

For promotion to CDR, Simpson found that, after education, being a Certified Registered Nurse Anesthetist (CRNA) or a Nurse Practitioner (NP) had the same positive effect on promotion as a non-hospital assignment (Simpson, 1992). In addition, an overseas assignment and assignment to one of the *Big Four* (at the time of her study there were four major medical facilities) had a positive effect on promotion (Simpson, 1992).

Being a CRNA or a NP was the most significant determinant of promotion to LCDR (Simpson, 1992). She did not analyze advanced degrees for LCDR, but CRNAs and NPs both have advanced degrees. For promotion to LCDR, an overseas assignment also increased the probability of promotion (Simpson, 1992). A non-hospital assignment was also positive for promotion, but the significance was not as strong as the other variables (Simpson, 1992).

Many things have changed since the 1992 study. Some accessions pipelines did not exist at the time of Simpson's study, mainly NROTC and MECP. In addition, the demographics of the NNC have changed since 1992—the percentage of males has increased. The operational tempo has increased due to the long war. Education attainment has increased in general, but especially in healthcare. The goal of this study is to re-evaluate promotion in the current environment.

G. EFFECTS OF INCREASED OPTEMPO

Research exists detailing how a wartime environment affects retention in a related corps, the Medical Service Corps. Erich Dietrich (2007) found that neither hostile, nor non-hostile deployments increase the chance of separation. He also found that multiple deployments do not increase the probability of separation (Dietrich, 2007).

In conclusion, promotion in the NNC is competitive. Competition is greatest for promotion to CDR and CAPT. The NNC has distinct retention patterns that are likely to affect promotion. The only NNC promotion study is over 20 years old, and the environment has changed significantly. No NNC specific promotion information exists for “newer” accession sources. In addition, degree creep in healthcare may have diluted one of the strongest promotion determinants—education.

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III. DATA SOURCES, GENERAL METHODOLOGY AND VARIABLE DEFINITIONS

A. DATA SOURCES

Deployment data were obtained from the Contingency Tracking System (CTS). This system tracks deployments in support of both Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). The Defense Manpower Data Center (DMDC) provided demographic and nurse specific information. Data collected spanned September 11, 2001 to July 1, 2010.

1. Contingency Tracking System

The Contingency Tracking System (CTS) provides a unique entry for each OEF/OIF deployment. A member who deployed multiple times in support of OEF/OIF has multiple entries. The first entry is dated September 11, 2001. The last entry in the dataset is dated July 1, 2010 and is the date of the DMDC extraction. For nurses, there were 14,019 unique deployment entries associated with 9,444 unique service members.

2. Demographic File

The DMDC extracted demographic information from the Active Duty Military Personnel File, the Active Duty Military Pay File, and the Defense Eligibility Enrollment Reporting System (DEERS).

The goal of this thesis is to study NNC promotion. One of the biggest data limitations is the CTS. The CTS only captures missions in support of OEF/OIF. Other deployments, such as deployments to the Pacific, are not captured by the database. Humanitarian Assistance and Disaster Relief (HADR) deployments are also absent from the database. Due to the high profile of humanitarian deployments in Navy Medicine, a HADR deployment is likely to be as significant for promotion as an OEF/OIF deployment. Humanitarian deployments, however, are not affected by war and remain fairly stable over time.

B. SAMPLE

The models included all NNC officers on AD from September 11, 2001 to July 1, 2010. Nurses serving at each rank during that time were classified as either retained or separated, junior eligible for promotion, eligible for promotion, and promoted. Separation was determined if the nurse left active duty during current rank before eligibility for promotion to the next rank. Junior eligibles were nurses who were still serving on active duty, but too junior for promotion. Those with 72 months service at their current rank were classified as promotion eligible. Finally, those nurses showing a paygrade change were classified as promoted. For the retention sample the entire rank group was included; for the promotion sample only promotion eligibles were included.

C. METHODOLOGY

A pooled cross-section of AD NNC officers from 2001 to 2010 was created by merging demographic, nurse specific, and CTS data. Rank cohorts were created for LT, LCDR, and CDR. A probit retention model was estimated for each rank to determine significant factors for leaving the NNC. The retention model provided a sensitivity analysis of the representativeness of the sample. Past studies have provided information regarding retention, and the sample behaved as expected in the retention model. This suggests that promotion trends of the sample will accurately represent promotion trends of the NNC. In addition, the retention model serves as a complement to the promotion model. Retention and promotion were not modeled jointly because a suitable instrumental variable was not identified. The probit promotion model for each rank cohort contained a variable to capture the effect of not being promoted while in-zone. This analysis resulted in three retention models and three promotion models.

D. VARIABLE DEFINITIONS

All variables are binary, taking a value of either zero or one.

1. Retention Model's Dependent Variable (LEAVE)

A LT, LCDR, or CDR nurse has left his or her rank cohort if commissioned service time is less than 11, 16, or 20 respective years and the nurse did not get promoted to the next rank.

2. Promotion Model's Dependent Variable (PROMOTE)

The promotion variable is a binary variable that takes on the value one if the nurse is promoted to the next rank and zero otherwise. A nurse is promoted in-zone if they are promoted the first time their lineal number places them in-zone for that year's promotion board. Coding zones by lineal numbers is the precise way of determining promotion eligibility; however, without that information it is possible to closely estimate promotion eligibility by time in service and months in current rank.

Aaron Carman and Ryan Mudd (2008) used time of commissioned service in days to estimate promotion eligibility. In their study they used 3,653 to 4,017 days of service (ten to 11 years) to establish in-zone promotions to LCDR (Carman & Mudd, 2008). Because some nurses may be given credit for prior nursing experience, not all nurses are commissioned as Ensigns. Therefore, months in current rank is a more accurate indicator of promotion eligibility for nurses than days of commissioned service. Lieutenants were considered eligible if they did not leave as a LT before becoming promotion eligible and were not too junior for promotion to LCDR. Specifically, eligible LTs had between 72 and 84 months service in their current rank. Nurses who served more than 84 months in the rank of LT were coded as above zone.

Promotion to CDR and CAPT was determined in a similar manner. Both were considered eligible for promotion if they did not leave at their current rank, and were not too junior for promotion to the next rank. The one year in zone window was applied so that eligibles had at least 72 months service at their current rank, but not more than 84 months service. Some nurses may promote in less than 72 months, and these nurses were still included in the sample with a promotion value of one.

3. Education

A NNC officer can have three levels of education. The minimum is a Bachelor's degree. A nurse may also have a Master's or a doctorate degree. Although data showed some nurses with only a High School Diploma, these entries were likely examples of nurses who entered the Navy as enlisted and did not update their education level. For analysis purposes, those nurses were grouped into the bachelor's degree category.

Based on Messmer and Pizanti's (2007) research showing that nurses with advanced degrees have higher retention rates and Simpson's (1992) study showing that education is a positive determinant for promotion, it is expected that nurses with Master's degrees will have a higher probability of promotion. It could be the case that nurses who attain Master's degrees add to their human capital, increasing both their productivity and probability of promotion. Or, the attainment of a Master's degree could signal the nurse's intention to make Navy Nursing a career. An advanced degree could also signal a higher ability nurse. The attainment of a doctorate degree has not been studied in the past. It is expected that a doctorate degree will increase a nurse's probability of promotion, either by increasing productivity or sending a positive signal regarding ability and/or intention to stay.

With the advent of online education, however, it would not be surprising if some of the effect of advanced education (the magnitude) has decreased over time. As more junior nurses receive advanced degrees, the edge it once had may be dulled. So while it is believed that an advanced degree (Master's degree) will have both a positive and significant effect on the probability of promotion, it will not be surprising if the effect has decreased over time. The doctorate degree may be more significant, signaling something that is not as common today. The doctorate degree may have become the new Master's degree.

4. Advanced Education

Because some nurses have advanced degrees in fields other than nursing, advanced degrees were coded as either nursing or non-nursing. This information was obtained via Primary Subspecialty Code (PSUB). A fairly large portion (35% of the LT

cohort, 29% of the LCDR cohort, and 29% of the CDR cohort) of the data could not be coded as the nurse's PSUB was missing. For analysis purposes three categories were generated: nursing education, non-nursing education, and unspecified education.

Past research has shown that those with advanced nursing degrees have a higher probability of promotion than those with advanced degrees in other fields. It is expected that the effect will be the same. Non-nursing advanced degrees may not be as applicable to a nurse's job and may not increase his productivity at work.

Although the coefficient for a nursing Master's degree is expected to be both positive and significant, it is possible that the results will show that the opposite is true. It could be the case, that over time, non-nursing advanced degrees give nurses complementary knowledge and skills that they could not gain through experience or specialization in nursing fields alone. For example, nurses with very high information technology skills may increase their nursing productivity by increasing their administrative skills.

Board certification can be another potentially important factor influencing promotion. Such certification can be gained in numerous specialties (clinical and administrative) through a variety of credentialing bodies, and the NNC indeed encourages its nurses to achieve certification. However, this variable could not be included in the study because within the relevant data range (September 11, 2001 to July 1, 2010), no nurses were coded as having a board certification from PSUBs that were missing the alpha component.

Due to extremely small sample size, another potential important educational attainment that cannot be included in this analysis is the Joint Professional Military Education (JPME)—a form of joint service military specific education. Courses are offered through the Naval War College and may be taken at various campuses or through distance learning. It is not expected that many nurses in the sample will have completed any JPME courses within the relevant data range.

5. Provider Status

Both Nurse Practitioners (NPs) and Certified Registered Nurse Anesthetists (CRNAs) were coded as providers; all other nurses received non-provider status. These nurses have more autonomy than other nurses; they are licensed independent practitioners. Although regulations differ from state to state, generally these nurses can see patients and prescribe medication. In the past, both of these variables were highly significant for promotion to LCDR and CDR. It is expected that these variables will remain significant variables to promotion and it would not be surprising if these variables were also significant for promotion to all controlled grades, including CAPT.

6. Critical Wartime Specialty

For analysis purposes, all non-provider sub-specialty codes eligible for the critical wartime specialty bonus were coded as critical wartime nurses. It is important to note that a nurse has been classified as a critical wartime specialist regardless of certification and other criteria that must be met by the individual to receive the bonus. This includes critical care nurses (1960), operating room nurses (1950), and mental health nurses (1930). Nurse practitioners and CRNAs were not included in the critical wartime category because the effect of these specific specialties has been uniquely captured under PROVIDER STATUS.

7. Commissioning Source

Accession data from past NNC studies is not applicable today because the proportion of nurses from various accession pipelines has changed. Direct accession, for example, was the primary accession source. Today direct accessions are only used to augment other accession pipelines. Some of today's pipelines were not in existence, or were in their infancy, when past studies were performed.

One of the biggest differences is the number of nurses accessed through Naval Reserve Officers Training Corps (NROTC). When the last promotion study was conducted there were no nurses from this accession pipeline eligible for controlled grade promotion. Recent retention studies have shown that NROTC accessions retain at much

lower rates than nurses from other sources. These nurses who retain long enough to be eligible for a controlled grade promotion could logically have a higher or lower probability for promotion. It could also be the case that NROTC will have no effect on promotion probability.

Because NROTC does not retain at the rate of other accession pipelines, the reasons for the lack of retention may influence this coefficient. For example, if NROTC nurses retain at a lower rate than nurses from other pipelines because they are younger and have fewer responsibilities, then NROTC stayers may be better than the leavers. If, however, NROTC nurses leave due to better civilian opportunities, then those who stay may be low-performing individuals who lack the civilian opportunities of the leavers. On the other hand, NROTC nurses who stay may do so because they perceive an increased probability of promotion.

Based on data from DMDC, the study pools together into the variable ‘ROTC’ both ROTC scholarship recipients and ROTC college program participants. From the available data field Medical Enlisted Commissioning Program (MECP) accessions were not identifiable. The behavior of the sample; however, suggests that MECs fall into the category coded as “other.”

8. Gender

Individuals were coded either male or female. Table 5 displays current gender distribution by rank. The last promotion study on Navy Nurses was performed in 1992. At that time, only 3.3% of employed civilian registered nurses were men (Simpson, 1992). Today 5.8% of employed civilian registered nurses are men (Minority, 2010). Current NNC demographics show that men comprise 37% of the NNC (Personnel Planner, 2011). Although only slightly over one-third of the NNC is male, half of all LCDRs are men. This may be related to the increased retention of males found by Messmer and Pizanti (2007). It could also be related to more MECs being males and retaining to a certain point before exiting.

Males may be preferred for some deployments with the Marine Corps; there may be a significant interaction term between male and OEF/OIF deployments. It is not expected that either gender will be significant for promotion probability.

Table 5. Current Gender Distribution in the Navy Nurse Corps

RANK	FEMALE	MALE
Rear Admiral Upper Half	1	0
Rear Admiral Lower Half	1	0
Captain	127	23
Commander	229	110
Lieutenant Commander	297	296
Lieutenant	524	343
Lieutenant Junior Grade	386	163
Ensign	269	121

9. Race

For analysis purposes, four race categories were created. White was the largest race category. The second largest category for the sample was “unknown;” this category was larger than all of the minority categories. Black was a smaller, but substantial category. All other races were pooled into one category labeled “other” due to the small numbers of nurses from other race categories. These categories are similar to current NNC statistics. Table 6 illustrates current percentages of each race serving in the NNC (Personnel Planner, 2011):

Table 6. Current Race Distribution in the Navy Nurse Corps

White	Black	Asian	Decline to Respond	American Indian or Alaskan Native	Native Hawaiian or Pacific Islander
72	13	7	4	1	1

*Race is not expected to have an impact on NNC promotions.

10. Big Three

This variable indicates whether a nurse has served in any of the large medical centers at his or her current rank. For the relevant data range the Big Three medical centers included Naval Medical Center Portsmouth, Naval Medical Center San Diego, and the National Naval Medical Center in Bethesda, Maryland. The effect of this variable is unknown. Although it was significant in the past promotion study, more recent retention studies have not found working at the Big Three significant (Simpson, 1992 & Messmer & Pizanti, 2007). It could be that war decreases the significance of gaining experience in large medical centers as other, perhaps more valued experiences, can be gained from deployment and smaller commands. Or, it could be significant as large medical centers tend to provide more acute and critical care experience than other assignments. This experience is likely to have a high operational value.

11. Overseas

This variable captures service at an overseas facility in the nurse's current rank. In the past this has been positive for promotion. It could remain a positive determinant for promotion if this overseas experience is as valued as other experiences. It could also decrease if the optempo environment decreases the value of such a tour.

12. Nurse Mobility

Nurse mobility is a new variable that has not been examined in prior retention or promotion studies. This variable captures the number of states a nurse served in at each rank. The idea was to capture a variety of experiences from a nurse who is mobile. This

variable is expected to be both significant and positive for two reasons. First, a nurse who serves in multiple states is most likely gaining various experiences, from different command sizes (clinics, hospitals, medical centers) and types (hospital, non-hospital, headquarters). In addition, nurses who move are more likely to experience various leadership styles and command cultures.

Second, moving one to two times each rank may signal the nurse's investment in the NNC. The nurse takes jobs that either need to be filled or are career enhancing. The variable is far from perfect. There are cases where the variable would not capture a major move. For example, a nurse stationed at Naval Medical Center Portsmouth with Permanent Change of Station orders to the Bureau of Medicine and Surgery may move across the state, but still reside in Virginia. Overall, however, it should provide a rough indication of nurse mobility.

13. Joint Service Spouse

This variable captures whether the nurse was married to another active duty service member while at his or her current rank. It is thought that a joint service spouse increases the probability of retention and has zero effect on promotion; however, this variable has never been studied in the NNC. It could be insignificant, positive, or negative. It could be that having a joint spouse increases promotion probability through a synergistic mentorship relationship. It could also be that having a joint spouse decreases promotion probability due to logistical stressors such as co-location that may put one or both spouses at career disadvantages.

14. Dependent Quantity

This binary variable captures the number of dependents in ranges: zero dependents, one dependent, two to four dependents, and five or more dependents. The number of dependents should not affect promotion.

15. Marital Status

This variable captures marital status for the period before promotion. It is expected that married and divorced service members will have a higher rate of promotion

than service members who never married. Most studies show that marriage has a positive effect on wages (Mehay & Bowman, 2005). It could be that marriage provides stability and makes nurses more productive, or that more productive nurses are selected into marriage (Mehay & Bowman, 2005).

16. Deployment

These variables capture deployment during the nurse's current rank. There are two binary variables. One captures whether the nurse was ever deployed to Afghanistan or Iraq in their current rank. The other variable captures other Middle East deployments besides Afghanistan and Iraq. For the CDR sample these two variables were combined into one variable (DEPLOY), capturing both types of deployments jointly. This was created for the CDR sample because too few nurses were deployed and separating the variables did not provide an adequate number of nurses for statistical analysis. This variable is expected to be positive across all grades.

17. Year/Cohort Controls

This variable was added to control for differences across year cohorts. A dummy was not created for each year, but groupings of five years. All nurses commissioned prior to 1986 were grouped into a category. Nurses commissioned between 1986 and 1990 comprised another group. In all there are five of these cohorts. The 1986-1990 cohort provides a break between the 1991 to 1995 cohort that starts containing nurses from newer accession sources. The 1996 to 2000 cohort provides a break between nurses who were commissioned prior to September 11, 2001.

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IV. DESCRIPTIVE STATISTICS

For each rank (LT, LCDR, and CDR) there are four separate populations: the entire sample, those who stayed (including those too junior for promotion), those eligible for promotion, and those who were promoted. This chapter provides the descriptive statistics for each group.

For accession source, the categories do not add up to 100. Some nurses were coded with multiple accession sources. Over 300 nurses in the sample were coded as both direct and unknown accessions. ROTC was the most reliable code, but three of these nurses were also coded as other.

Very few nurses have JPME, less than one-half of one percent. For promotion to LCDR, JPME was a perfect predictor of success for two nurses; for promotion to CDR, JPME was also a perfect predictor of success for two nurses. JPME was excluded from both models to retain these observations, but JPME was included in the model for CAPT promotion. Recent data did not capture a significant increase in JPME completion.

A few trends were noted across all controlled grades. First, the majority of nurses hold a nursing degree as their highest degree. Most of the nurses had a specialty other than critical wartime, NP, or CRNA. Most were direct accessions. The majority of the nurses were white. Most of the nurses were female. Marriage was the most common marital status. Most had between two to four dependents. And lastly, few had an active duty spouse.

A. LIEUTENANTS

Table 7 shows the descriptive statistics for LTs. The entire LT sample consisted of 3,797 unique nurses. Of those 3,797 LTs, 2,798 did not separate and 2,143 stayed long enough to be promotion eligible. Lastly, 1,296 nurses were promoted to LCDR.

Table 7. Descriptive Statistics for Lieutenants

Variable	Whole Sample	Stayed	Eligible	Promoted
EDUCATION				
Bachelor's	84%	83%	82%	81%
	(0.3643)	(0.3771)	(0.3836)	(0.3905)
Master's	13%	15%	16%	16%
	(0.3338)	(0.3590)	(0.3667)	(0.3686)
Doctorate	3%	2%	2%	3%
	(0.1699)	(0.1388)	(0.1370)	(0.1576)
Non-Nursing Field	15%	18%	16%	14%
	(0.3559)	(0.3858)	(0.3702)	(0.3515)
Nursing Field	78%	73%	74%	80%
	(0.4142)	(0.4465)	(0.4369)	(0.3965)
Unspecified Field	4%	6%	5%	4%
	(0.2027)	(0.2288)	(0.2207)	(0.2034)
NURSING CHARACTERISTICS				
Critical Wartime	37%	39%	40%	47%
	(0.4832)	(0.4885)	(0.4903)	(0.4995)
NP/CRNA	9%	10%	10%	13%
	(0.2794)	(0.2982)	(0.2993)	(0.3369)
MILITARY EDUCATION				
JPME	0%	0%	0%	0%
	(0.0561)	(0.0378)	(0.0374)	(0.0481)
ACCESSION SOURCE				
Direct	68%	74%	70%	64%
	(0.4676)	(0.4409)	(0.4588)	(0.4791)
ROTC	13%	7%	8%	11%
	(0.3341)	(0.2612)	(0.2703)	(0.3076)
OCS	7%	8%	10%	14%
	(0.2618)	(0.2670)	(0.2967)	(0.3492)
Unknown	15%	15%	15%	21%
	(0.3613)	(0.3597)	(0.3615)	(0.4046)
Other	9%	12%	14%	14%
	(0.2893)	(0.3243)	(0.3485)	(0.3443)
LOCATIONS SERVED				
Big3	7%	6%	7%	10%
	(0.2471)	(0.2336)	(0.2512)	(0.2995)
Portsmouth	2%	2%	3%	4%
	(0.1530)	(0.1461)	(0.1582)	(0.1889)

Variable	Whole Sample	Stayed	Eligible	Promoted
San Diego	3%	2%	3%	4%
	(0.1640)	(0.1507)	(0.1637)	(0.1963)
Bethesda	1%	1%	2%	2%
	(0.1184)	(0.1158)	(0.1232)	(0.1504)
Overseas	28%	26%	26%	35%
	(0.4472)	(0.4368)	(0.4384)	(0.4765)
One State	48%	53%	50%	36%
	(0.4997)	(0.4994)	(0.5001)	(0.4805)
Two States	33%	28%	28%	36%
	(0.4688)	(0.4467)	(0.4486)	(0.4794)
Three or More States	18%	18%	21%	28%
	(0.3857)	(0.3858)	(0.4044)	(0.4473)
Afghanistan or Iraq	6%	6%	6%	9%
	(0.2424)	(0.2396)	(0.2455)	(0.2856)
Other Middle East	8%	8%	8%	11%
	(0.2702)	(0.2658)	(0.2696)	(0.3172)
DEMOGRAPHICS				
Married	65%	64%	66%	77%
	(0.4756)	(0.4792)	(0.4751)	(0.4190)
Never Married	31%	31%	30%	19%
	(0.4612)	(0.4640)	(0.4588)	(0.3947)
Divorced	4%	4%	4%	3%
	(0.1923)	(0.2034)	(0.2017)	(0.1792)
Widowed	0%	0%	0%	0%
	(0.0162)	(0.0189)	(0.0216)	(0.0278)
Active Duty Spouse	3%	4%	4%	3%
	(0.1699)	(0.1857)	(0.1963)	(0.1771)
No Dependents	27%	24%	23%	16%
	(0.4433)	(0.4266)	(0.4198)	(0.3700)
One Dependent	20%	19%	19%	17%
	(0.3974)	(0.3956)	(0.3901)	(0.3749)
Two to Four Dependents	47%	50%	52%	58%
	(0.4994)	(0.5001)	(0.4999)	(0.4943)
Five or More Dependents	6%	6%	7%	9%
	(0.2405)	(0.2441)	(0.2544)	(0.2878)
White	70%	69%	70%	74%
	(0.4569)	(0.4641)	(0.4582)	(0.4401)
Black	9%	9%	9%	10%

Variable	Whole Sample	Stayed	Eligible	Promoted
	(0.2923)	(0.2868)	(0.2836)	(0.2985)
Other Race	6%	6%	5%	6%
	(0.2376)	(0.2343)	(0.2235)	(0.2463)
Unknown Race	14%	17%	16%	10%
	(0.3496)	(0.3714)	(0.3654)	(0.2985)
Female	66%	65%	65%	58%
	(0.4725)	(0.4765)	(0.4769)	(0.4943)
Male	34%	35%	35%	43%
	(0.4728)	(0.4768)	(0.4774)	(0.4946)
YEAR/COHORT CONTROLS				
Commissioned 1986-1990	8%	11%	14%	3%
	(0.2677)	(0.3067)	(0.3436)	(0.1666)
Commissioned 1991-1995	25%	31%	36%	37%
	(0.4315)	(0.4638)	(0.4809)	(0.4841)
Commissioned 1996-2000	37%	36%	39%	53%
	(0.4841)	(0.4805)	(0.4879)	(0.4995)
Commissioned 2001-2005	31%	23%	14%	11%
	(0.4625)	(0.4199)	(0.3426)	(0.3125)
Commissioned 2006-2010	3%	2%	2%	2%
	(0.1602)	(0.1529)	(0.1285)	(0.1376)
Observations	3797	2798	2143	1296
Standard deviations in parentheses				

The LT sample is unique from all other groups in two important ways; the LTs had markedly different education attainment and accession sources. The most common degree (over 80%) was a bachelor's degree. The LT sample was the only group with a significant percentage of nurses from newer accession pipelines. Specifically, the LT group had the highest percentage of ROTC and "other" which is presumed to include MECP.

The LTs also had the greatest mobility of all promotion cohorts. Over 50% of the entire group served in two or more states. The LTs deployed more than any group, with the vast majority deployed to locations in the Middle East other than Iraq or Afghanistan.

The LTs were also, by percentages, more likely to serve both overseas and at the Big Three. And for the Big Three, the LTs were most likely to serve at Portsmouth.

The biggest difference between stayers and leavers is seen in the accession source. ROTC accessions are least likely to retain while “other” accessions are most likely to retain. LTs in non-nursing or unspecified fields are also more likely to retain; these nurses likely hold a Master’s degree and those with Master’s degrees have higher rates of retention. In addition, those who served in more than one state were less likely to retain.

B. LIEUTENANT COMMANDERS

Table 8. shows the descriptive statistics for LCDRs. The entire LCDR sample consisted of 2,289 unique nurses. Of those 2,289 LCDRs, 1,980 did not separate from the Navy. Of those who did not separate, 1,271 stayed long enough to reach promotion eligibility. Lastly, 495 nurses were promoted to LCDR.

Table 8. Descriptive Statistics for Lieutenant Commanders

Variable	Whole Sample	Stayed	Eligible	Promoted
EDUCATION				
Bachelor's	67%	64%	67%	59%
	(0.4706)	(0.4788)	(0.4706)	(0.4920)
Master's	32%	34%	31%	40%
	(0.4646)	(0.4731)	(0.4646)	(0.4904)
Doctorate	2%	2%	2%	1%
	(0.1244)	(0.1318)	(0.1245)	(0.0896)
Non-Nursing Field	23%	23%	21%	23%
	(0.4233)	(0.4221)	(0.4075)	(0.4215)
Nursing Field	62%	61%	64%	64%
	(0.4857)	(0.4877)	(0.4812)	(0.4815)
Unspecified Field	12%	12%	11%	11%
	(0.3195)	(0.3259)	(0.3072)	(0.3171)
NURSING CHARACTERISTICS				
Critical Wartime	38%	38%	35%	41%
	(0.4863)	(0.4846)	(0.4784)	(0.4927)

Variable	Whole Sample	Stayed	Eligible	Promoted
NP/CRNA	18%	18%	16%	19%
	(0.3810)	(0.3811)	(0.3650)	(0.3958)
MILITARY EDUCATION				
JPME	0%	0%	0%	0%
	(0.0590)	(0.0635)	(0.0397)	(0.0635)
ACCESSION SOURCE				
Direct	77%	82%	86%	85%
	(0.4219)	(0.3879)	(0.3464)	(0.3549)
ROTC	5%	5%	3%	0%
	(0.2229)	(0.2084)	(0.1660)	(0.0635)
OCS	9%	6%	3%	2%
	(0.2837)	(0.2359)	(0.1591)	(0.1476)
Unknown	19%	20%	24%	34%
	(0.3941)	(0.3997)	(0.4243)	(0.4747)
Other	5%	5%	6%	9%
	(0.2255)	(0.2116)	(0.2282)	(0.2849)
LOCATIONS SERVED				
Big3	6%	6%	7%	10%
	(0.2315)	(0.2359)	(0.2592)	(0.3043)
Portsmouth	2%	2%	2%	4%
	(0.1448)	(0.1441)	(0.1519)	(0.1923)
San Diego	2%	2%	3%	3%
	(0.1418)	(0.1458)	(0.1637)	(0.1770)
Bethesda	2%	2%	2%	3%
	(0.1244)	(0.1299)	(0.1494)	(0.1770)
Overseas	16%	15%	12%	12%
	(0.3629)	(0.3532)	(0.3255)	(0.3243)
One State	63%	63%	64%	61%
	(0.4836)	(0.4822)	(0.4805)	(0.4891)
Two States	26%	26%	24%	26%
	(0.4394)	(0.4363)	(0.4277)	(0.4383)
Three or More States	10%	9%	10%	12%
	(0.2954)	(0.2932)	(0.3042)	(0.3220)
Afghanistan or Iraq	5%	5%	3%	4%
	(0.2273)	(0.2252)	(0.1829)	(0.2018)
Other Middle East	3%	3%	2%	2%
	(0.1746)	(0.1701)	(0.1275)	(0.1262)
DEMOGRAPHICS				

Variable	Whole Sample	Stayed	Eligible	Promoted
Married	72%	71%	71%	81%
	(0.4506)	(0.4531)	(0.4552)	(0.3926)
Never Married	20%	20%	20%	12%
	(0.3965)	(0.3986)	(0.4030)	(0.3290)
Divorced	9%	9%	9%	6%
	(0.2799)	(0.2832)	(0.2790)	(0.2425)
Widowed	0%	0%	0%	0%
	(0.0467)	(0.0502)	(0.0626)	(0.0635)
Active Duty Spouse	4%	4%	6%	7%
	(0.1934)	(0.2050)	(0.2328)	(0.2497)
No Dependents	19%	19%	18%	14%
	(0.3948)	(0.3931)	(0.3851)	(0.3446)
One Dependent	19%	20%	19%	18%
	(0.3934)	(0.3974)	(0.3940)	(0.3827)
Two to Four Dependents	55%	54%	56%	62%
	(0.4979)	(0.4981)	(0.4964)	(0.4863)
Five or More Dependents	7%	7%	7%	7%
	(0.2521)	(0.2521)	(0.2472)	(0.2497)
White	75%	74%	79%	83%
	(0.4323)	(0.4360)	(0.4086)	(0.3740)
Black	8%	8%	7%	6%
	(0.2746)	(0.2749)	(0.2579)	(0.2461)
Other Race	4%	4%	3%	2%
	(0.1975)	(0.1885)	(0.1591)	(0.1540)
Unknown Race	13%	14%	11%	8%
	(0.3317)	(0.3427)	(0.3180)	(0.2697)
Female	68%	69%	74%	75%
	(0.4685)	(0.4627)	(0.4382)	(0.4349)
Male	33%	31%	26%	25%
	(0.4685)	(0.4627)	(0.4382)	(0.4349)
YEAR/COHORT CONTROLS				
Commissioned before 1986	11%	13%	19%	5%
	(0.3131)	(0.3328)	(0.3934)	(0.2150)
Commissioned 1986-1990	32%	37%	51%	64%
	(0.4683)	(0.4817)	(0.5001)	(0.4792)
Commissioned 1991-1995	26%	23%	20%	28%
	(0.4396)	(0.4195)	(0.4035)	(0.4489)
Commissioned 1996-	28%	26%	11%	4%

Variable		Whole Sample	Stayed	Eligible	Promoted
2000		(0.4508)	(0.4394)	(0.3082)	(0.1971)
Commissioned 2001-2005		4%	4%	1%	1%
		(0.1913)	(0.1897)	(0.1080)	(0.1095)
Commissioned 2006-2010		1%	0%	0%	0%
		(0.0722)	(0.0449)	(0.0485)	0.00
Observations		2289	1980	1271	495
Standard deviations in parentheses					

The LCDR group is unique in a few ways. The majority of LCDRs in the sample had a bachelor's of nursing; however, the attainment of Master's degrees was increasing. With increased education the percentage of NPs and CRNAs doubled from the LT sample. Also, the percentage of nurses with a non-nursing degree as their highest degree also increased.

The representation of two accession sources, ROTC and "other," decreases. This effect was more pronounced for ROTC graduate who accounted for only 3% of the eligible population; nurses from the "other" accession source accounted for just 6% of all eligibles. MECP (presumed to make up the majority of the "other" category) started a few years before ROTC and would therefore comprise more of the eligible population.

The mobility of the nurses is decreasing while the percentage of married nurses, including those with an active duty spouse, is increasing. Specifically, the majority lived in just one state. Deployments were different as well. While the majority of LTs were deployed to locations besides Afghanistan or Iraq, the LCDRs were deployed to Afghanistan or Iraq. Similar to the LTs, the LCDRs were more likely to serve at Portsmouth rather than San Diego or Bethesda.

For LCDRs the biggest difference between stayers and leavers is again, just like the LTs, the accession source. This time Officer Candidate School (OCS) graduates are more likely to leave than ROTC graduates. And while male LTs are more likely to retain, male LCDRs are less likely to retain. OCS graduates made up less than 9% of the LCDR sample and over half of the LCDR OCS graduates in the sample were male.

C. COMMANDERS

Table 9 shows the descriptive statistics for CDRs. The entire CDR sample consisted of 1,423 unique nurses. Of those 1,423 CDRs, 1,376 did not separate from the Navy. Of those who did not separate, 1,108 stayed long enough to be eligible for promotion. Lastly, 276 nurses were promoted to CAPT.

Table 9. Descriptive Statistics for Commanders

Variable	Whole Sample	Stayed	Eligible	Promoted
EDUCATION				
Bachelor's	51%	51%	52%	24%
	(0.5001)	(0.5001)	(0.5000)	(0.4273)
Master's	45%	45%	44%	64%
	(0.4973)	(0.4974)	(0.4962)	(0.4794)
Doctorate	4%	5%	5%	12%
	(0.2042)	(0.2075)	(0.2135)	(0.3207)
Non-Nursing Field	20%	20%	19%	17%
	(0.3982)	(0.3978)	(0.3949)	(0.3766)
Nursing Field	60%	61%	61%	66%
	(0.4893)	(0.4878)	(0.4873)	(0.4748)
Unspecified Field	14%	14%	14%	16%
	(0.3506)	(0.3511)	(0.3498)	(0.3701)
NURSING CHARACTERISTICS				
Critical Wartime	31%	30%	30%	34%
	(0.4617)	(0.4597)	(0.4575)	(0.4735)
NP/CRNA	18%	18%	18%	25%
	(0.3871)	(0.3845)	(0.3825)	(0.4359)
MILITARY EDUCATION				
JPME	0%	0%	0%	0%
	(0.0648)	(0.060)	(0.060)	(0.060)
ACCESSION SOURCE				
Direct	93%	93%	97%	99%
	(0.257)	(0.247)	(0.173)	(0.120)
ROTC	0%	0%	0%	0%
	(0.038)	(0.027)	0.00	0.00
OCS	1%	1%	0%	0%
	(0.092)	(0.093)	(0.052)	(0.060)

Variable	Whole Sample	Stayed	Eligible	Promoted
Unknown	25%	25%	23%	35%
	(0.433)	(0.433)	(0.422)	(0.478)
Other	2%	2%	1%	0%
	(0.137)	(0.134)	(0.079)	0.00
LOCATIONS SERVED				
Big3	8%	8%	8%	13%
	(0.265)	(0.267)	(0.279)	(0.337)
Portsmouth	3%	3%	4%	6%
	(0.177)	(0.180)	(0.189)	(0.241)
San Diego	3%	3%	3%	5%
	(0.169)	(0.168)	(0.177)	(0.212)
Bethesda	2%	2%	2%	2%
	(0.126)	(0.128)	(0.133)	(0.146)
Overseas	9%	9%	7%	4%
	(0.2872)	(0.2854)	(0.2513)	(0.1960)
One State	70%	70%	71%	66%
	(0.4606)	(0.4582)	(0.4551)	(0.4735)
Two States	20%	20%	19%	26%
	(0.3982)	(0.3967)	(0.3942)	(0.4379)
Three or More States	9%	8%	8%	8%
	(0.2842)	(0.2779)	(0.2691)	(0.2713)
Afghanistan or Iraq	1%	1%	1%	1%
	(0.1206)	(0.1167)	(0.0793)	(0.1039)
Other Middle East	3%	3%	3%	5%
	(0.1732)	(0.1741)	(0.1570)	(0.2122)
Deploy	5%	4%	3%	6%
	(0.2073)	(0.2059)	(0.1725)	(0.2341)
DEMOGRAPHICS				
Married	73%	74%	74%	79%
	(0.4440)	(0.4409)	(0.4363)	(0.4107)
Never Married	14%	14%	16%	9%
	(0.3484)	(0.3496)	(0.3631)	(0.2875)
Divorced	9%	9%	9%	11%
	(0.2882)	(0.2906)	(0.2854)	(0.3163)
Widowed	1%	1%	1%	1%
	(0.0915)	(0.0930)	(0.0793)	(0.1039)
Active Duty Spouse	7%	7%	8%	9%
	(0.2472)	(0.2511)	(0.2663)	(0.2926)

Variable	Whole Sample	Stayed	Eligible	Promoted
No Dependents	14%	14%	15%	10%
	(0.3440)	(0.3474)	(0.3606)	(0.3025)
One Dependent	19%	19%	18%	19%
	(0.3911)	(0.3887)	(0.3840)	(0.3946)
Two to Four Dependents	62%	62%	61%	66%
	(0.4863)	(0.4863)	(0.4869)	(0.4760)
Five or More Dependents	6%	6%	5%	5%
	(0.2331)	(0.2327)	(0.2228)	(0.2198)
White	84%	84%	87%	91%
	(0.3682)	(0.3653)	(0.3403)	(0.2875)
Black	5%	4%	4%	1%
	(0.2073)	(0.2043)	(0.2037)	(0.1197)
Other Race	2%	2%	2%	2%
	(0.1234)	(0.1255)	(0.1230)	(0.1336)
Unknown Race	10%	10%	7%	6%
	(0.3017)	(0.2986)	(0.2634)	(0.2341)
Female	83%	83%	84%	86%
	(0.3783)	(0.3777)	(0.3631)	(0.3527)
Male	17%	17%	16%	14%
	(0.3789)	(0.3784)	(0.3631)	(0.3527)
YEAR/COHORT CONTROLS				
Commissioned before 1986	50%	51%	62%	46%
	(0.5002)	(0.5001)	(0.4858)	(0.4993)
Commissioned 1986-1990	39%	40%	37%	56%
	(0.4890)	(0.4894)	(0.4842)	(0.4975)
Commissioned 1991-1995	10%	10%	3%	1%
	(0.3017)	(0.2936)	(0.1570)	(0.1039)
Commissioned 1996-2000	1%	1%	0%	0%
	(0.1118)	(0.1137)	(0.0671)	0.00
Commissioned 2001-2005	1%	0%	0%	0%
	(0.1087)	(0.0659)	(0.0300)	0.00
Commissioned 2006-2010	0%	0%	0%	0%
	(0.0265)	0.00	0.00	0.00
Observations	1423	1376	1108	276
Standard deviations in parentheses				

The CDR sample has higher educational attainment, lower mobility, and little representation of nurses from ROTC and “other.” At CDR, Master’s degrees become common. The percentage of nurses with doctorate degrees is small, but increasing. This group also had the highest percentage of NP/CRNAs. No ROTC graduates were eligible for promotion and very few nurses from the “other” accession source were promotion eligible.

The majority of CDRs lived in just one state and were less likely to serve overseas than any other rank. CDR deployments were more like LT deployments, most deployed to other locations in the Middle East. While both LTs and LCDRs were likely to serve at Portsmouth, the CDRs were more evenly distributed among the Big Three. Lastly, the CDRs were most likely to have an active duty spouse.

There were no distinct differences between CDRs who stayed and CDRs who left. This rank contained very few officers from accession pipelines associated with strong retention trends: OCS, ROTC, and MECP. There are no gender trends between the stayers and the leavers. There is little mobility and no mobility trends emerged.

In conclusion, there are some major differences across the controlled grades. First, CDRs are more likely to have Master’s degrees and a small percentage may have a doctorate degree. Only the LT group contained a significant number of nurses from ROTC and the “other” accession source; the CDR population was mainly comprised of direct accessions. The LTs were the most mobile and CDRs the least. LTs and CDRs were most likely to be deployed to locations other than Afghanistan or Iraq. The CAPT model had the highest percentage of nurses with an active duty spouse.

V. RESULTS

This chapter presents regression results. The tables below show the results for promotion to each rank: LCDR, CDR, and CAPT. The retention results are denoted by the heading “leaving,” this column predicts the probability of the nurse leaving the NNC. Negative and significant coefficients decrease the probability of the nurse leaving, or increase the probability of the nurse staying. The column to the right of “leaving” predicts the probability of the nurse promoting to the next rank. Coefficients that are positive and significant indicate variables that increase the probability of promotion. Negative and significant coefficients indicate variables that decrease promotion probability.

Each model’s goodness of fit is indicated at the bottom by the Chi-squared test as well as the pseudo R-squared. The Chi-squared test provides the probability that all of the coefficients in the model equal zero. The pseudo R-squared indicates the percentage of variance the model explains. The higher the R-squared, the higher the model’s explanatory power.

All of the coefficients are compared to the reference groups. The reference groups are: bachelor’s degree, highest education in a non-nursing field, direct accession, married, two to four dependents, white, female, and commissioned prior to 1986. The reference group for all variables within the nursing characteristics category and the locations served category are the absence of those variables, or compared to all the rest. For example, NP/CRNA is compared to all other nurse types. A deployment to Iraq or Afghanistan is compared to all others who have not deployed to Iraq or Afghanistan, et cetera.

A. LIEUTENANTS

Table 10. Marginal Effects for Lieutenants.

LT RETENTION AND PROMOTION TO LCDR		
Variable	Leaving	Promoting
ABOVE ZONE INDICATOR		
Not Promoted In Zone	-0.215	-0.558
	(0.015)**	(0.025)**
EDUCATION		
Master's	-0.055	0.025
	(0.016)**	(0.036)
Doctorate	0.112	-0.089
	(0.042)**	(0.112)
Nursing Field	0.137	0.079
	(0.015)**	(0.042)+
Unspecified Field	0.028	-0.016
	(0.056)	(0.077)
NURSING CHARACTERISTICS		
Critical Wartime	-0.017	0.109
	(0.013)	(0.032)**
NP/CRNA	-0.073	0.169
	(0.016)**	(0.045)**
ACCESSION SOURCE		
ROTC	0.177	-0.048
	(0.026)**	(0.054)
OCS	0.051	0.140
	(0.027)*	(0.049)*
Unknown	0.031	0.147
	(0.019)+	(0.036)**
Other	-0.058	-0.111
	(0.023)*	(0.044)*
LOCATIONS SERVED		
Big3	0.012	0.139
	(0.023)	(0.054)*
Overseas	-0.044	0.030
	(0.013)**	(0.041)
Two States	0.069	0.134
	(0.016)**	(0.033)**

LT RETENTION AND PROMOTION TO LCDR		
Variable	Leaving	Promoting
Three or More States	0.015	0.132
	(0.020)	(0.043)**
Afghanistan or Iraq	-0.046	0.056
	(0.017)*	(0.057)
Other Middle East	-0.053	0.134
	(0.015)**	(0.048)*
DEMOGRAPHICS		
Never Married	-0.03	-0.205
	(0.014)*	(0.036)**
Divorced	-0.066	-0.121
	(0.023)*	(0.070)+
Active Duty Spouse	-0.058	***
	(0.030)	***
No Dependents	0.111	-0.047
	(0.021)**	(0.040)
One Dependent	0.027	-0.040
	(0.017)	(0.037)
Five or More Dependents	0.013	0.035
	(0.025)	(0.055)
Black	-0.017	0.019
	(0.017)	(0.046)
Other Race	-0.029	0.102
	(0.020)	(0.053)+
Unknown Race	-0.047	-0.142
	(0.016)**	(0.040)**
Male	-0.023	0.004
	(0.013)+	(0.031)
YEAR\COHORT CONTROLS		
Commissioned 1986-1990	-0.133	0.164
	(0.026)*	(0.065)*
Commissioned 1991-1995	-0.123	0.294
	(0.024)**	(0.061)**
Commissioned 1996-2000	-0.003	0.251
	(0.031)	(0.063)**
Commissioned 2001-2005	0.157	0.059
	(0.039)**	(0.066)
Commissioned 2006-2010	0.058	0.111

LT RETENTION AND PROMOTION TO LCDR		
Variable	Leaving	Promoting
	(0.041)	(0.080)
Observations	3797	2143
Chi-Square	1346.33	1261.01
p-value	0.0000	0.0000
Pseudo R-square	03076	0.4385
Standard errors in parentheses		
+significant at 10%, *significant at 5%, **significant at 1%		

B. LT RETENTION RESULTS

For LTs, education, accession source, location served, gender and dependents are important predictors of retention. Most notably, those with doctorate degrees (a very small percentage of LT nurses) were more likely to leave. However, those with Master's degrees were more likely to stay. A nurse whose highest degree was in nursing, (this would be true for all nurses with a minimum of a bachelor's degree) was more likely to leave. Nurse Practitioners, those with a minimum of a Master's degree, were more likely to stay.

Those from ROTC, OCS, and an unknown source were likely to leave. The magnitude of the effect was greatest for ROTC accessions, increasing the probability of leaving by 17.7 percentage points. Some of the OCS accessions may be retirement eligible at LT. The only source positive for staying was the "other" source that is believed to include a large number of MECPs.

Deployment and serving overseas decreased the probability of leaving. The probability of leaving; however, was increased if the nurse served in two states (compared to nurses who served in just one state). Serving in three or more states did not have a significant effect on leaving.

Dependents, of any number, decreased the probability of leaving compared to nurses without dependents. Unknown race also decreased the probability of leaving. Males were less likely to leave.

Lastly, year cohort data show that the majority of nurses who separated from 2001 to 2010 were commissioned in 2001–2005. Cohort years from 1986 to 1995 were

positive for retention. Nurses commissioned from 2006 to 2010 were unlikely to be eligible for separation and the coefficient for this cohort is insignificant.

C. LCDR PROMOTION RESULTS

The predicted probability of promotion from LT to LCDR for the reference NNC officer is 0.6504. The factors that are important predictors for promotion from LT to LCDR are: highest degree in nursing, NP or CRNA, critical wartime specialty, accession source, locations served (Big Three, number of states, and deployment), and marital status. More details of the results are provided below.

1. Education

Degree level was not significant for promotion; however, highest education in nursing was significant. Again, like in the retention model, all nurses with a minimum of a bachelor's degree have their highest degree in nursing--the majority of the sample had a bachelor's degree. Nurse practitioners and/or CRNAs had a 16.9 percentage point higher probability of promoting than all other nurses. Nurses with a critical wartime specialty had a 10.9 percentage point increase in the probability of promotion.

2. Accession Source

Accession source was significant for promotion. Both OCS and an "unknown" accession source were positive for promotion (relative to direct accession). ROTC had no statistically significant effect on promotion. The category "other" that is presumed to be made up of MECPs was a negative determinant for promotion, "other" decreased promotion probability by 11.1 percentage points. It is important to note here that the "other" variable, while assumed to be MECP, was derived from the "Source Code" data field. The source code data field is not as precise as the gain category. For this reason, the effect of MECP cannot be isolated.

3. Locations Served

The variable locations served were highly significant for promotion. Serving at one of the Big Three medical centers had the largest effect on promotion, increasing the

probability of promotion by 13.9 percentage points. Serving in two or more states increased promotion probability by over 13 percentage points. A deployment to somewhere in the Middle East other than Iraq or Afghanistan increased promotion probability by 13.4 percentage points. Deployments to Afghanistan or Iraq were not statistically significant for the LT population; however, most of the LT population was deployed to other locations in the Middle East.

4. Demographics

Marital status and race were significant determinants for promotion. A LT who had never been married, all else equal, had a promotion probability 20.5 percentage points lower than a married LT. Furthermore, a divorced nurse had a promotion probability 12.1 percentage points lower than a married nurse, all else equal. In addition, the “unknown” race category was a negative determinant for promotion while “other race” was a positive determinant.

5. Cohort Controls

The year cohorts show that those commissioned between 1991 and 2000 were most likely to promote to LCDR in the relevant data range. A few nurses commissioned between 1986 and 1990 promoted to LCDR. And, very few if any nurses commissioned between 2001 and 2010 would be eligible for promotion.

Overall, the data suggest that for promotion to LCDR, experience and mobility are more important than education. Education was not a significant determination of promotion for the rank of LCDR; however, variables capturing experience and mobility were. Possessing a critical wartime specialty or being a NP or CRNA were all positive and significant determinants of promotion.

D. LIEUTENANT COMMANDERS

Table 11. Marginal Effects for Lieutenant Commanders

LCDR RETENTION AND PROMOTION TO CDR		
Variable	Leaving	Promoting
ABOVE ZONE INDICATOR		
Not Promoted In Zone	-0.123	-0.679
	(0.011)**	(0.026)**
EDUCATION		
Master's	-0.043	0.191
	(0.009)**	(0.041)**
Doctorate	-0.037	-0.106
	(0.008)*	(0.152)
Nursing Field	0.011	0.079
	(0.009)	(0.046)+
Unspecified Field	-0.019	-0.100
	(0.011)	(0.078)
NURSING CHARACTERISTICS		
Critical Wartime	0.004	0.146
	(0.009)	(0.045)**
NP/CRNA	0.022	0.161
	(-0.014)+	(0.072)*
ACCESSION SOURCE		
ROTC	0.069	-0.230
	(0.029)**	(0.094)
OCS	0.114	0.038
	(0.029)**	(0.117)
Unknown	-0.01	0.211
	(0.009)	(0.053)**
Other	0.012	0.225
	(0.015)	(0.092)*
LOCATIONS SERVED		
Big3	-0.007	-0.002
	(0.014)	(0.074)
Overseas	0.007	-0.146
	(0.010)	(0.051)*
Two States	-0.003	-0.030
	(0.008)	(0.048)
Three or More States	-0.003	-0.033

LCDR RETENTION AND PROMOTION TO CDR		
Variable	Leaving	Promoting
	(0.012)	(0.065)
Afghanistan or Iraq	-0.028	0.208
	(0.010)*	(0.155)
Other Middle East	0.018	-0.211
	(0.035)	(0.122)
DEMOGRAPHICS		
Never Married	0.007	-0.149
	(0.012)	(0.050)**
Divorced	-0.003	-0.136
	(0.012)	(0.053)*
Widowed	---	-0.094
	---	(0.242)
Active Duty Spouse	-0.027	---
	-0.012	---
No Dependents	0.01	-0.020
	(0.012)	(0.060)
One Dependent	-0.005	-0.047
	(0.008)	(0.045)
Five or More Dependents	-0.006	0.017
	(0.012)	(0.074)
Black	-0.014	-0.020
	(0.009)	(0.066)
Other Race	0.022	-0.029
	(0.020)	(0.107)
Unknown Race	-0.021	-0.219
	(0.008)*	(0.038)**
Male	0.005	-0.015
	(0.008)	(0.043)
YEAR/COHORT CONTROLS		
Commissioned 1986-1990	-0.013	0.183
	(0.019)	(0.051)**
Commissioned 1991-1995	0.09	0.014
	(0.039)**	(0.065)
Commissioned 1996-2000	0.048	-0.139
	(0.030)+	(0.067)+
Commissioned 2001-2005	0.06	0.182
	(0.046)+	(0.149)
Commissioned 2006-2010	0.492	---

LCDR RETENTION AND PROMOTION TO CDR		
Variable	Leaving	Promoting
	(0.167)**	---
Observations	2289	1268
Chi Square	535.38	814.87
p-value	0.0000	0.0000
Pseudo R-square	0.2955	0.4804
Standard errors in parentheses		
+ significant at 10%; * significant at 5%; ** significant at 1%		

E. Lcdr Retention Results

In the Lcdr retention model, education level, accession source, and deployment are important determinants of retention. In particular, education is a positive determinant of staying at the rank of Lcdr. Master's and doctorate degrees increased retention by four percentage points. The probability of retention decreased 2.2 percentage points for advanced practice nurses.

For accession source, both ROTC and OCS increase the probability of leaving. OCS has the greatest effect, an 11.4 percentage point increase. ROTC had a smaller effect, increasing the probability of leaving by 6.9 percentage points. This change from LT could be attributed to prior enlisted experience that may make these nurses retirement eligible as junior LCDRs. The vast majority of ROTC accessions have no prior experience, so these nurses may be less likely to leave as LCDRs. No other accession sources are significant for retention at the rank of Lcdr.

A deployment to Iraq or Afghanistan, the majority of Lcdr deployments, is significant for increasing the probability of retention by 2.8 percentage points. No other locations served were significant for retention. Those commissioned after 1991 were more likely to leave the NNC.

F. CDR PROMOTION RESULTS

The predicted probability of promotion from LCDR to CDR for the reference NNC officer is 0.3241. Overall, the following factors are significant predictors of promotion to CDR: advanced education, highest degree in nursing, NP or CRNA, critical wartime specialty, accession source, service overseas, and marital status. Further details are provided below.

1. Education

Education starts to matter for promotion to CDR. Although doctorate degrees still remain insignificant, Master's degrees increase the probability of promotion by 19.1 percentage points. Highest degree in a nursing field increases promotion probability by 7.9 percentage points. Both advanced practice and critical wartime specialties increase the probability of promotion. Nurses who have a critical wartime specialty increase their probability of promotion by 14.6 percentage points. Nurse Practitioner and CRNA increase promotion probability by 16.1 percentage points.

2. Accession Source

Nurses from two accession sources were more likely to promote. Nurses classified with an unknown accession source have an increased promotion probability of 21.1 percentage points. Nurses thought to be MECs, nurses accessed through a category known as "other," had a 22.5 percentage point increase in their probability of promotion. For promotion to CDR, both OCS and ROTC were insignificant. ROTC and OCS accessions had a greater probability of leaving while at the rank of LCDR.

3. Locations Served

The only location significant for promotion was an overseas tour. An overseas tour decreased promotion probability by 14.6 percentage points. And while a deployment to Afghanistan or Iraq slightly increased retention, no deployments at the rank of LCDR were significant for promotion. Serving at one of the Big Three or in multiple states appeared to have no effect on promotion either.

4. Demographics

Demographically, married nurses had a higher probability of promoting to CDR than either single or divorced nurses. Individuals who had never married had a promotion probability that was 14.9 percentage points lower than married ones. Divorced nurses have a 13.6 lower promotion probability than married nurses. Nurses who did not report their race were less likely to promote by 21.9 percentage points.

5. Cohort Controls

Nurses commissioned between 1986 and 1990 were most likely to promote to CDR during the relevant data range.

At the rank of LCDR both education and service locations affect promotion probability. Advanced education starts to matter. Overseas service decreased promotion probability suggesting that overseas tours were no longer considered hardship tours. While deployments did not affect promotion they did increase retention. As more deployed nurses retain, more deployed nurses are likely to promote.

It is important to note that there is a time element to promotion, and nurses who were commissioned between 1986 and 1990 were most likely to promote to CDR during the relevant range. Some of these nurses had 15 years of service before September 11, 2001. The results must be interpreted with caution as the environment changed drastically for nurses who were eligible for CDR. Many nurses promoted to CDR served the majority of their career in a peacetime environment.

G. COMMANDERS

Table 12. Marginal Effects for Commanders

CDR RETENTION AND PROMOTION TO CAPT		
Variable	Leaving	Promoting
ABOVE ZONE INDICATOR		
Not Promoted In Zone	-0.042	-0.707
	(0.010)**	(0.032)**
EDUCATION		
Master's	-0.007	0.171
	(0.005)	(0.032)**
Doctorate	---	0.355
	---	(0.110)**
Nursing Field	-0.014	0.046
	(0.008)*	(0.040)
Unspecified Field	-0.013	-0.017
	(0.005)*	(0.064)
NURSING CHARACTERISTICS		
Critical Wartime	0.005	-0.006
	(0.007)	(0.038)
NP/CRNA	0.042	0.146
	(0.022)**	(0.068)*
JPME		
JPME	0.059	0.064
	(0.109)	(0.241)
ACCESSION SOURCE		
ROTC	0.121	---
	(0.231)	---
OCS	---	0.090
	---	(0.407)
Unknown	-0.01	0.075
	(0.005)+	(0.050)
Other	-0.008	---
	(0.006)	---
LOCATIONS SERVED		
Big3	-0.004	0.056
	(0.008)	(0.066)
Overseas	-0.003	-0.044

CDR RETENTION AND PROMOTION TO CAPT		
Variable	Leaving	Promoting
	(0.007)	(0.054)
Two States	0.019	0.032
	(0.011)*	(0.042)
Three or More States	0.058	-0.057
	(0.032)**	(0.046)
Deploy	-0.01	0.034
	-0.005	(0.096)
DEMOGRAPHICS		
Never Married	0.003	-0.099
	(0.010)	(0.034)*
Divorced	-0.01	0.076
	-0.005	(0.061)
Widowed	---	-0.040
	---	(0.150)
Active Duty Spouse	---	---
	---	---
No Dependents	-0.01	0.053
	-0.005	(0.058)
One Dependent	0.006	-0.028
	(0.007)	(0.034)
Five or More Dependents	-0.001	0.021
	(0.009)	(0.065)
Black	0.037	-0.086
	(0.029)*	(0.045)
Other Race	---	-0.019
	---	(0.092)
Unknown Race	0.009	0.006
	(0.010)	(0.053)
Male	-0.001	-0.023
	(0.006)	(0.037)
YEAR/COHORT CONTROLS		
Commissioned 1986-1990	-0.008	-0.060
	(0.005)	(0.029)*
Commissioned 1991-1995	0.005	-0.150
	(0.009)	(0.017)**
Observations	1423	1096
Chi-Square	93.12	655.24

CDR RETENTION AND PROMOTION TO CAPT		
Variable	Leaving	Promoting
p-value	0.0000	0.0000
Pseudo R-square	0.2255	0.5297
Standard errors in parentheses		
+ significant at 10%; * significant at 5%; ** significant at 1%		

H. CDR RETENTION RESULTS

For CDRs, education, highest degree in nursing, NP or CRNA, accession source, service in three or more states, marital status, active duty spouse, and race were all significant predictors of retention. Specifically, all of the nurses with doctorate degrees (62 nurses) were retained. Highest degree in nursing, or having an unspecified highest degree, increased retention by one and a half percentage points. NPs and/or CRNAs were four percentage points more likely to separate at the rank of CDR.

Most of the nurses eligible for promotion to CAPT were direct accessions. Only 12 nurses in the sample were OCS graduates, and all 12 retained. ROTC and “other” were insignificant at this rank. Accessions from an unknown source had an increased probability of retention of one percentage point.

Serving in more than one state was significant for increasing the probability of separation by 1.9 percentage points. Serving in three or more states increased the probability of separation by 5.8 percentage points.

Demographics had a marked effect on retention. All of the CDRs with an active duty spouse (91 nurses) retained past 20 years of service. All ten widows in the sample retained. The probability of separation increased 3.7 percentage points for black nurses while the entire sample of nurses from the “other” race category, 21 nurses, retained.

I. CAPT PROMOTION RESULTS

The predicted probability of promotion from CDR to CAPT for the reference NNC officer is 0.1476. Overall, the following factors are significant predictors of promotion to CAPT: advanced education, NP or CRNA, accession pipeline, and marital status. Further details are provided below.

1. Education

Education was highly significant for promotion to CAPT. Attaining a doctorate degree increased promotion probability by 35.5 percentage points. Nurses with Master's degrees were 17.1 percentage points more likely to promote. Advanced practice nursing remained significant and increased promotion probability by 14.6 percentage points.

2. Accession Source

For accession pipelines, neither ROTC nor "other" had any nurses eligible for promotion. OCS and the unknown accession source were not significant determinants of promotion. This is not surprising as the majority of those eligible for promotion to CAPT were direct accessions.

3. Locations Served

No service locations were significant.

4. Demographics

For demographics, never being married decreased promotion probability by 9.9 percentage points.

5. Cohort Controls

Commissioning prior to 1986 was significant for promotion to CAPT. Education was the most significant factor for promotion to CAPT. No locations served were significant; however, the time element of promotion is critical. The majority of nurses eligible for CAPT from 2001 to 2010 were commissioned prior to 1986. Some of the nurses in the sample served 20 years before September 11, 2001. In fact, all of the nurses who became eligible for promotion to CAPT would have served over half their career during peacetime.

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VI. LIMITATIONS

This study was developed using average flow points and each nurse was given a one year in-zone window for promotion. If the nurse promoted and was not “in-zone,” the nurse was re-classified as eligible. However, if the nurse did not promote and was ineligible (too junior) for promotion correction was difficult. The only available correction was during the regression analysis. If all of the nurses from a particular cohort did not promote to the next rank then those observations were excluded from the eligible population. The number of junior eligibles incorrectly classified was likely small and should not affect the analysis integrity.

In addition, without a variable to disentangle retention and promotion the coefficients may not be representative of the entire sample (both stayers and leavers). ROTC, for example, has low retention rates. And while ROTC was an insignificant determinant of promotion, significant coefficients would have been suspect. For example, if ROTC had been significant and negative for promotion that would not necessarily make a statement about ROTC graduates. It could have been the case that ROTC nurses who stayed were different from those who left.

The Heckman sample selection correction can be used to remedy bias from sample truncation; however, a suitable instrumental variable must be identified. A variable in the dataset must affect retention, but have no effect on promotion. Active duty spouse is thought to increase retention and have no effect on promotion. Only a small percentage of nurses, particularly at lower ranks, had an active duty spouse. Without a suitable instrumental variable this technique could not be applied.

A. FITNESS REPORT/INDIVIDUAL PERFORMANCE

Individual nurse performance was not available. These data would increase the explanatory power of the study. For example, without individual performance data it is unclear whether NP/CRNA has an effect on promotion.

It could be the case that this variable is capturing high performing nurses. Fitness report information would control for performance and a clearer statement regarding the effect of NP/CRNA on promotion could be made.

B. PHYSICAL READINESS TEST (PRT)

This study was not able to utilize PRT data because the unique identifiers of the datasets did not match, PRT uses Social Security Number and DMDC has a unique scrambled identifier. PRT data could serve as a proxy for unobservable characteristics—such as determination or individual discount rate. At the very least, PRT data would add explanatory power by accounting for nurses who failed to select due to PRT failures.

C. HUMANITARIAN ASSISTANCE DISASTER RELIEF (HADR)

Humanitarian Assistance Disaster Relief (HADR) deployment data were not available. It is likely that for nurses these deployments have significant effects on both retention and promotion. Adding humanitarian deployments would increase the explanatory power of both

VII. CONCLUSION

This study investigated the effects of variables on promotion in a wartime environment; its purpose was to estimate the effect of deployment on promotion. While this study describes how variables behaved over the last ten years it should not be assumed that the variables will continue to behave in the same manner. The military medicine environment is changing and everything is becoming more joint, from deployments to bases. The effect of variables on promotion may change as well.

Each rank was affected by different variables, and promotion to LCDR probably best demonstrated the variables that affect promotion in a wartime environment. Only nurses who were captured in the LT cohort during the relevant range were likely to serve the majority of their career during war. For these nurses, mobility was highly important. Variables denoting locations served, except for overseas were all significant and positive determinants of promotion. Deployment, service at one of the Big Three, and moving at least one time while at the rank of LT increased the probability of promotion. Education, specifically advanced degrees (over 15% of LTs in the sample had advanced degrees), was not significant for promotion. This suggests that in a wartime environment flexibility and experience are more valued at the rank of LT than advanced degrees.

For LCDRs, a group who was as likely to spend the majority of their career in a peacetime environment as they were in an optempo environment, a combination of traits was desired. Master's degrees were a positive and significant determinant of promotion, but so was having a critical wartime specialty or being a CRNA or NP. These nurses were literally and figuratively in the middle of the LTs and the CDRs.

The CDRs were the group most likely to spend the majority of their career in a peacetime environment, and little changed since the last promotion study over 20 years ago. Education is still a significant and positive determinant of promotion. The difference is that today a doctorate degree yields the same increase in promotion probability that a Master's degree yielded 20 years ago. Advanced practice nursing remains significant and positive across all grades, including CAPT.

In conclusion, deployment was a significant determinant of promotion for nurses who served the majority of their career in a wartime environment. Flexibility and experience was highly valued in junior nurses. As nurses became more senior, education increased in importance. This was the case in an optempo environment, but the environment in the military is currently undergoing numerous changes. The effect of these variables may be altered by the new environment, and other significant variables may emerge.

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